

## Clinical Profile and Mortality in Children with Pneumonia

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### Abstract

**Background :** Pneumonia is the leading killer in under-five children. Therefore, by identifying the danger signs, we are able to predict children who are at higher risk of mortality. The objective of the study is to identify the relationship between the clinical profile and mortality in children with pneumonia at Dr. Hasan Sadikin General Hospital, Bandung.

**Methods:** This was an analytical study with a retrospective case control approach using medical records with patient's age limitation of 1–60 month. The study period started on January 1st 2010 and ended on December 31st 2011. All types of pneumonia included whereas congenital anomalies, immunocompromised and Down's syndrome patients were excluded in this study. Data were presented as frequency distribution.

**Results :** During the study period, there were 653 children under age of 5 with pneumonia. Only 56 subjects met the inclusion and exclusion criteria. Twenty-eight patients with pneumonia were cured and 28 died. Based on the phi's coefficient, tachycardia ( $\alpha$ -value = 0.019) and hepatomegaly ( $\alpha$ -value = 0.001) were significant predictors of death and based on the Mantel-Haenszel analysis, hepatomegaly (OR=9.62, CI 95% 2.349–39.35) was significant as a risk for mortality. Inability to drink, cyanosis, tachypnea, grunting, vomiting, convulsion, and unconsciousness were not related to mortality.

**Conclusion:** Tachycardia and hepatomegaly have a significant relationship with mortality in under-five children with pneumonia. [AMJ.2015;2(1):235–40]

**Keywords:** Children, clinical sign, death, pneumonia, predictor

### Introduction

Pneumonia has been the leading killer in under-five children where it kills more than 5 million children worldwide.<sup>1</sup> It is the major cause of child mortality specially in developing countries.<sup>2</sup> Indonesia is one of the 15 countries that is responsible for three quarters of childhood pneumonia cases globally in under-five children.<sup>1</sup>

A National Household Health Survey held in 2001 in Indonesia showed that pneumonia causes death of in nearly 300 infants every day.<sup>3</sup> In spite of the administration of antibiotics, the prevalence of pneumonia is high and still kills more children than AIDS, Measles and Malaria combined.<sup>1</sup>

WHO has implemented Acute Respiratory Infection (ARI) control program to screen children with higher risk of death. However, this program used lower chest wall findings as signs for predicting death, causing over referral of suspected pneumonia to the hospital.<sup>2,4</sup>

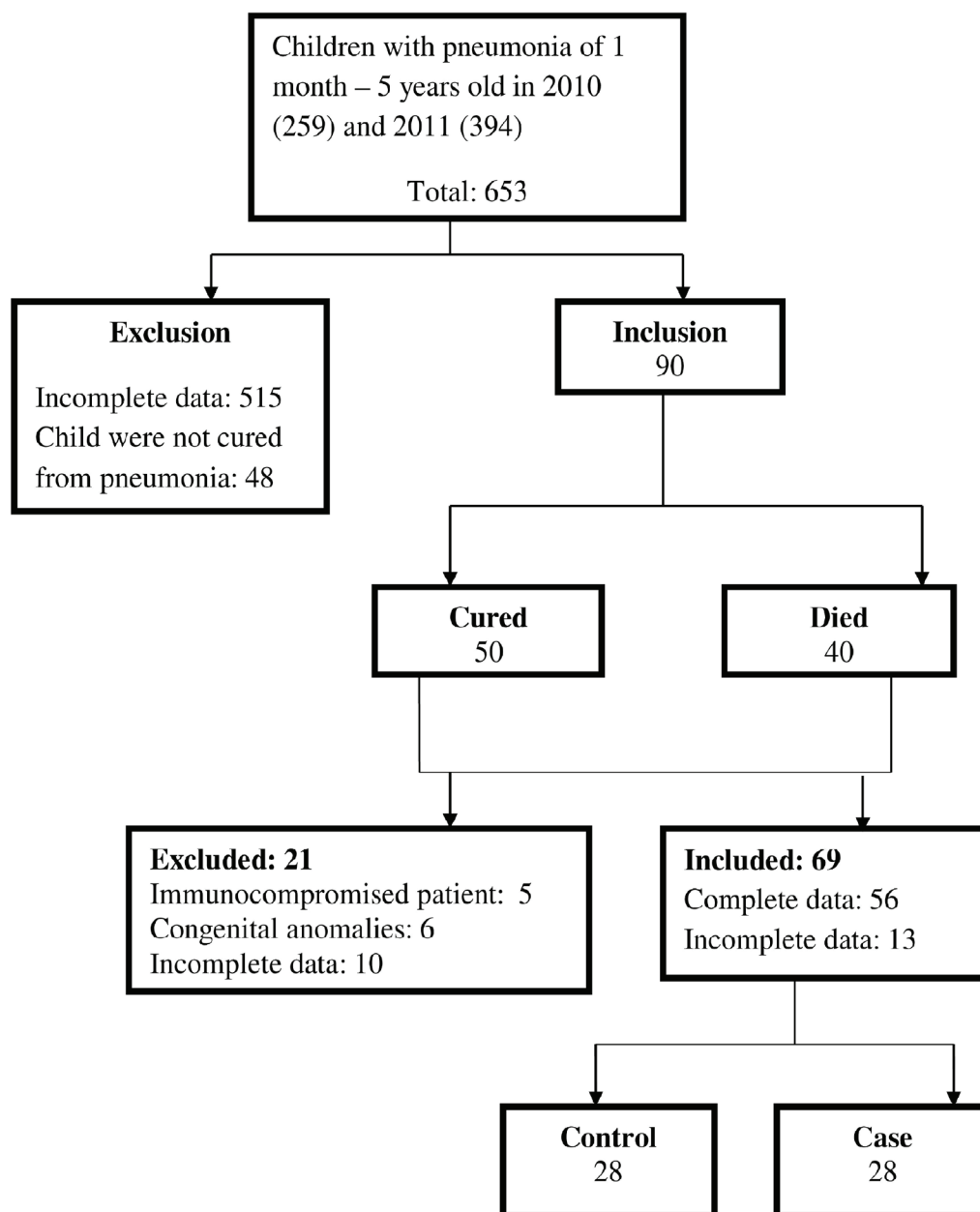
Several studies showed tachypnea and anemia are predictors of death in pneumonic children, but it is understood that further research needed to determine their significance.<sup>2</sup> It is also shown that inability to drink and cyanosis have been considered as danger signs for urgent referral and according to WHO, inability to drink and cyanosis has proven to be danger signs for very severe pneumonic patient.<sup>1</sup> Many studies have shown various clinical signs that predict death in pneumonia.<sup>2,3,5-8</sup> However, less number of studies are carried out in Indonesia.

The objective of the study is to identify the relationship between the clinical profile and mortality among children with pneumonia in Dr. Hasan Sadikin General Hospital, Bandung, Indonesia.

### Methods

This was a retrospective case control study based on medical record. All children under-

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**Figure 1 Flow chart on Children of 1 month – 5 years old with Pneumonia in 2010 and 2011 in Department of Child Health of Dr. Hasan Sadikin General Hospital Bandung.**

five children with any type of pneumonia admitted in Department of Child Health of Dr. Hasan Sadikin General Hospital from January 1st 2010–December 31st 2011 were eligible for this study.

Patients with congenital anomalies, immunocompromised and Down's syndrome and incomplete data in the medical record

were excluded. Nine danger signs, i.e. tachycardia, tachypnea, cyanosis, grunting, convulsion, unconsciousness, inability to drink, vomiting, and hepatomegaly, were assessed to determine their relationship with death in children under-5 with pneumonia.

The sample size of the study was calculated by using tachycardia as a significant mortality

**Table 1 Cross Tabulation of Clinical Signs with Mortality using Phi's Coefficient**

| Variables          | Died | Cured | A     |
|--------------------|------|-------|-------|
| Tachycardia        |      |       |       |
| Yes                | 5    | 0     | 0.019 |
| No                 | 23   | 28    |       |
| Tachypnea          |      |       |       |
| Yes                | 27   | 25    | 0.299 |
| No                 | 1    | 3     |       |
| Cyanosis           |      |       |       |
| Yes                | 4    | 2     | 0.388 |
| No                 | 24   | 26    |       |
| Grunting           |      |       |       |
| Yes                | 5    | 3     | 0.445 |
| No                 | 23   | 25    |       |
| Convulsion         |      |       |       |
| Yes                | 8    | 5     | 0.342 |
| No                 | 20   | 23    |       |
| Unconsciousness    |      |       |       |
| Yes                | 9    | 3     | 0.051 |
| No                 | 19   | 25    |       |
| Inability to drink |      |       |       |
| Yes                | 2    | 0     | 0.150 |
| No                 | 26   | 28    |       |
| Vomiting           |      |       |       |
| Yes                | 6    | 4     | 0.485 |
| No                 | 22   | 24    |       |
| Hepatomegaly       |      |       |       |
| Yes                | 15   | 3     | 0.001 |
| No                 | 13   | 25    |       |

five children with any type of pneumonia admitted in Department of Child Health of Dr. Hasan Sadikin General Hospital from January 1st 2010–December 31st 2011 were eligible for this study.

Patients with congenital anomalies, immunocompromised and Down's syndrome and incomplete data in the medical record were excluded. Nine danger signs, i.e. tachycardia, tachypnea, cyanosis, grunting, convulsion, unconsciousness, inability to drink, vomiting, and hepatomegaly, were assessed to determine their relationship with death in children under-5 with pneumonia.

The sample size of the study was calculated by using tachycardia as a significant mortality predictor with OR 6.075.<sup>3</sup> The level of significance was 0.05% and power of 80%. Both case and control group showed the same ratio. Total minimum sample size required for validity is 48; 24 children per group needed.<sup>9</sup>

Univariate analysis was done to know the distribution and percentage of age and sex of patient. Cross tabulation using phi's coefficient was used to assess the relationship between the clinical profile and mortality. The level of significance was alpha <5%.

Maentel-Haenszel was used to calculate

**Table 2 Bivariate Analysis of Clinical Signs Association with Mortality using Odd Ratio**

| Variables          | Died | Cured | OR   | 95% CI      | P     |
|--------------------|------|-------|------|-------------|-------|
| Tachycardia        |      |       |      |             |       |
| Yes                | 5    | 0     | -    | -           | -     |
| No                 | 23   | 28    |      |             |       |
| Tachypnea          |      |       |      |             |       |
| Yes                | 27   | 25    | 3.24 | 0.031-33.22 | 0.322 |
| No                 | 1    | 3     |      |             |       |
| Cyanosis           |      |       |      |             |       |
| Yes                | 4    | 2     | 2.17 | 0.363-12.92 | 0.396 |
| No                 | 24   | 26    |      |             |       |
| Grunting           |      |       |      |             |       |
| Yes                | 5    | 3     | 1.81 | 0.389-8.447 | 0.449 |
| No                 | 23   | 25    |      |             |       |
| Convulsion         |      |       |      |             |       |
| Yes                | 8    | 5     | 1.84 | 0.518-6.538 | 0.346 |
| No                 | 20   | 23    |      |             |       |
| Unconsciousness    |      |       |      |             |       |
| Yes                | 9    | 3     | 3.95 | 0.937-16.60 | 0.061 |
| No                 | 19   | 25    |      |             |       |
| Inability to drink |      |       |      |             |       |
| Yes                | 2    | 0     | -    | -           | -     |
| No                 | 26   | 28    |      |             |       |
| Vomiting           |      |       |      |             |       |
| Yes                | 6    | 4     | 1.64 | 0.407-6.577 | 0.488 |
| No                 | 22   | 24    |      |             |       |
| Hepatomegaly       |      |       |      |             |       |
| Yes                | 15   | 3     | 9.62 | 2.349-39.35 | 0.002 |
| No                 | 13   | 25    |      |             |       |

the odd ratio to analyze the odds of death occurring in children with pneumonia

## Results

In 2010, 7.7% of pneumonia patients died, while in 2011, 5.5% patients died. In table 1, data showed that tachycardia and hepatomegaly had significant relationship with death in children under 5 with pneumonia.

In table 2, odd ratio was analyzed. Hepatomegaly (OR 9.62; p= 0.02) correlated significantly with death in pneumonia patients.

## Discussion

The mortality rates in the Department of Child Health of Dr. Hasan Sadikin Hospital, Bandung in year 2010 was 7.7% and in 2011 was 5.1%. In the cross tabulation test, tachycardia and hepatomegaly were found as a significant predictor of death in pneumonia children. However, a study in Papua New Guinea showed no correlation between the 2 factors with mortality.<sup>5</sup>

Occurrence of tachycardia can be explained

by the inflammatory reaction that interferes with the gaseous exchange in lung. The disturbances of gaseous exchange increases the alveolar and arterial PO<sub>2</sub> differences, thus leads to tachypnea and tachycardia as a compensation mechanism.<sup>10</sup>

A study conducted in Thailand also showed that hepatomegaly has association to death.<sup>12</sup> Several mechanisms had been proposed to explain the presence of liver enlargement. It is suggested that congestion of liver with red blood cells in pneumonia patients with anemia or chronic liver disease could be a reason for enlarged liver.<sup>11,13</sup> Hyperinflation of lung could causes liver edge to be pushed further below and is palpable in the physical examination.

Although in this study other clinical signs showed no relationship, danger signs such as inability to drink and cyanosis were found to be important death predictors.<sup>5,14</sup> When patients reach exhaustion, they experience a ventilation and perfusion mismatch, leading to a hypoxia state and probably respiratory failure.<sup>15</sup>

Patients in Dr. Hasan Sadikin General Hospital received immediate interventions of ventilator and oxygen, so this could be a reason why cyanosis was not found in the subject. However inability to drink and grunting were mostly absent due to failure of physician in recording these signs during physical examination and history taking.

Convulsion and unconsciousness were not associated with death but associated with encephalopathy. In pneumonia, acute hypoxia can be the causative factor for hypoxic ischemic encephalopathy. This lack of oxygen to the brain will decrease the level of consciousness and causes convulsions to occur.<sup>16</sup> Some patient experience vomiting which was probably due to bacterial causative pneumonia.<sup>17</sup>

The limitations of the study was the availability of data in the medical records. During the observation of the medical record, it was found that most of the physicians fail to note the important danger pneumonia signs in anamnesis and physical examination. A standardized medical record for pneumonia should be established by which physician must meet during the management of pneumonia patients.

Besides, most of the patients were sent home against advice. The mortality statuses of these patients were not known, thus limiting the number of data analyzed as patients underwent complete management of pneumonia. This study concludes that

tachycardia and hepatomegaly is a significant mortality predictors in children under 5 with pneumonia at Dr. Hasan Sadikin Hospital, Bandung.

## References

1. Wardlaw T, Johansson EW, Hodge M. Pneumonia: The forgotten killer of children. New York: The United Nations Children's Fund / World Health Organization; 2006 [Cited 2012 March 16]; Available from: <http://www.unicef.org/>.
2. Lupisan S, Ruutu P, Erma Abucejo-Ladesma P, Quiambao BP, Gazom L, Sombrero L, et al. Predictors of death from severe pneumonia among children 2–59 months old hospitalized in Bohol, Philippines : implications for referral criteria for at first-level health facility. *Trop Med Int Health*. 2007;12(8):962–71.
3. Kisworini P, Setyati A, Sutaryo. Mortality predictors of pneumonia in children. *Paediatr Indones*. 2010;50(3):149–53.
4. Mulholland K. Childhood pneumonia mortality: a permanent global emergency. *Lancet*. 2007;370(9583):285–9.
5. Shann F, Barker J, Poore P. Clinical signs that predict death in children with severe pneumonia. *Pediatr Infect Dis J*. 1989;8(12):852–5.
6. Deivanayagam N, Nedunchelian K, Ramasamy S, Sudhandirakannan, Ratnam S. Risk factor for fatal pneumonia : a case control study. *Indian Pediatr*. 1992;29(12):1529–32.
7. Narayanan M, Falade A. Clinical risk factors for death in children with pneumonia. Australia: International Child Health Review Collaboration; 2006 [Cited 2012 March 23]; Available from: <http://www.ichrc.org>.
8. Sehgal V, Sethi GR, Sachdev HP, Satyanarayana L. Predictors of mortality in subjects hospitalized with acute lower respiratory tract infections. *Indian Pediatr*. 1997;34(3):213–9.
9. Sainani K. Sample size for case control. Stanford: 2007 [Cited 2012 June 12]; Available from: <http://www.stanford.edu>.
10. Crowe JE. Kendig's disorders of the respiratory tract in children. 7th ed. Victor C, Boat TF, editors. Philadelphia: W.B. Saunders Company; 2006.
11. Lakhanpaul M, Atkinson M, Stephenson T. Community acquired pneumonia in children: a clinical update. *Arch Dis Child Educ Pract Ed*. 2004;89(2):29–34.

12. Suwanjutha S, Ruangkanchanasetr S, Chantarojanasiri T, Hotrakitya S. Risk factors associated with morbidity and mortality of pneumonia in Thai children under 5 years. *Southeast Asian J Trop Med Public Health*. 1994;25(1):60–6.
13. Wintrobe M, Greer J. Wintrobe's Clinical Hematology. 12th ed. Greer JP, editor. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2009.
14. Nascimento-Carvalho C, Rocha H, Jesus RS, Benguigui Y. Childhood Pneumonia: Clinical Aspects Associated with Hospitalization or Death. *Braz J Infect Dis*. 2002;6(1):22–8.
15. Mbugua S. Pneumonia in Pre-School Children. Turku: Turku University of Applied Sciences; 2011.
16. David R. Clinical Pediatric Neurology. 3rd ed. David R, editor. New York: Demos Medical Publishing; 2009.
17. Prober C, Sectish T. Pneumonia. 18th ed. Robert Kliegman RB, Hal Jenson BS, editors. Iowa: W.B.Sanders; 2007.